AGENTS FOR REPELLING AND INACTIVATING PATHOGENIC ORGANISMS OF PLANTS

BACKGROUND OF THE INVENTION

Every year, truck farms, meristem operations and plant cultivators sustain great damage due to organisms that infect sets (e.g. plantlets), young plants, mother plants and seeds, destroying them or rendering them useless. If, for example, viruses enter a cultivation, it can be assumed that 100 % of the plants will be damaged. The only option open to the truck farms then is the radical measure of destroying the entire culture.

Specifically active agents are commercially available with which a few phytopathogens can be combated without influencing the vitality of the plant. These agents, designated as pesticides, are systemically effective but usually have only a narrow spectrum of activity.

On the other hand, a significantly broader spectrum of activity is offered by common disinfecting agents based on aldehydes, phenols, halogens, peroxides and quaternary ammonium compounds. If these "surface disinfecting agents" get on the plant or are directly applied to the plant, this always entails irreversible damage to the plant. This means that such disinfecting agents can only be used on working surfaces, positioning surfaces and devices such as, e.g., knives and the like. The surfaces must be freed thereafter from adhering remnants of active substances in order not to endanger the plants during subsequent working steps.

However, a sufficient inactivation is not even assured on surfaces since these agents always exhibit significant gaps in their activity against phytopathogenic organisms.

DE OS 32 27 126 and DE OS 32 29 097 teach that certain combinations of anionic surfactants, aliphatic and aromatic carboxylic acids as well as a few heteroaromatic acids

are capable of comprehensively killing off or inactivating viruses, bacteria and fungi without gaps in their activity.

The microbes tested according to the above-cited Offenlegungsschriften and patents were primarily human-pathogenic organisms with a low infectiousness like those recommended as test microbes by, among others, the German Society for Hygiene and Microbiology (DGHM) and the German Society for Veterinary Medicine (DVG).

The application of the teaching to highly infectious and resistant phytopathogenic organisms displayed a microbicidal and virus-inactivating activity that was just as persevering as had already been shown to be the case with the human-pathogenic test germs.

However, further tests for plant compatibility with the same agents regularly resulted in a damaging of the test plants in the form of severe scorching, so that the use on plants appeared to be excluded.

It was surprisingly found that the use of certain acid combinations and surfactant combinations in the presence of glycols overcomes the previous deficiency in the combating of phytopathogenic organisms, and that, when applied directly onto a plant, they retain a pronounced bactericidal, fungicidal and viricidal activity and do not damage the plant cells (roots, stems, leaves, flowers and fruit) in the application concentration.

SUMMARY OF THE INVENTION

The present invention relates to agents for treating plants and their environment with the goal of killing off phytopathogenic bacteria, fungi, viruses and viroids and of hindering their spread. Even pathogens (e.g., viruses) that are already on plants can be killed off or inactivated by these agents by moistening roots, stems, leaves and flowers without damaging the plant cells. The biological behavior of the plant is also not altered by the treatment. Working areas in the vicinity of the plants (e.g., tables, knives,

positioning surfaces) that could cause a contamination are also freed in a long-lasting manner of noxious organisms therewith without phytotoxic residues having to be subsequently removed.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

The invention is further described in the following non-limiting examples.

Example 1)

Components	Parts by weight (%)
Alkylarylsulfonate potassium	8.50 % by wt.
Propane diol-1,2	20.50
Toluene sulfonate potassium	10.00
p-Hydroxybenzoic acid	6.90
Hydroxyethanoic acid	3.80
Propanol-2	28.00
Water (desalinated)	18.50

Example 2)

Components	Parts by weight (%)
Alkylsulfonate potassium	10.00 % by wt.
Ethane diol-1,2	15.00
Cumene [cumol] sulfonate potassium	10.00
p-Hydroxybenzoic acid	6.90
Oxoethanoic acid	7.00

Propanol-1	15.00
Propanol-2	15.00
Water (desalinated)	18.50

Example 3)

Components	Parts by weight (%)
Alkylarylsulfonate potassium	12.00 % by wt.
Ethane diol-1,2	18.00
Cumene [cumol] sulfonate potassium	8.00
Benzoic acid	7.00
2-Hydroxypropionic acid	7.00
Propanol-1	20.00
Propanol-2	15.00
Water (desalinated)	13.00

Example 4)

Components	Parts by weight (%)
Alkylsulfonate (C8-C18) potassium	7.00 % by wt.
Alkylsulfonate (C12) potassium	3.00
Ethane diol-1,2	12.00
Cumene [cumol] sulfonate potassium	11.50
Benzoic acid	9.00
2-Hydroxyethanoic acid	4.50
Propanol-1	15.00

Propanol-2	15.00
Water (desalinated)	23.00

Example 5)

Components	Parts by weight (%)
Alkylarylsulfonate sodium	12.00 % by wt.
Cumene [cumol] sulfonate sodium	8.50
o-Hydroxybenzoic acid	9.50
2-Hydroxypropionic acid	5.00
Propanol-1	22.00
Propanol-2	20.00
Water (desalinated)	23.50

Bactericidal activity on the plant (biotest)

A. Young plant pelargoniums and begonias were contaminated by spraying with Xanthomonas campestris. A leaf surface of 1 cm^2 had 10^4 KBE after the contamination.

A treatment with example 4 in concentrations of 1.0 %, 2.0 % and 3.0 % was conducted, also with a spraying method, one hour after the inoculation.

Specimens were taken one hour after the treatment. The germs of the treated and of the untreated controls (without example 4) were removed from the leaves by ultrasound (wash liquid of 0 °C) and their number determined.

B. Pelargoniums and begonias were treated by spraying with example 4.

The contamination with Xanthomonas campestris took place, also with a spraying method, 24 hours after the treatment with example 4.

Specimens were taken one hour after the contamination. The germs of the treated and of the untreated controls (without example 4) were removed from the leaves by ultrasound (wash liquid of 0 °C) and their number determined.

Scorching, lesions on the leaf edges and the leaf blades, germ reduction and leaf compatibility are cited in the following table:

		Pelargoniums		Begonias	
A	Concentration	Germ reduction	Toxic phenomena on leaves	Germ reduction	Toxic phenomena on leaves
	1.0% example 4	97%;93%	No lesions	<99%	No lesions
	2.0% example 4	100%;99.5 %	No lesions	99.9%	No lesions
	3.0% example 4	100%;99.9 %	A few leaf edge lesions	99.9%	Slight lesions on leaf edges
	1.0% example 5	98%;95%	Lesions on the leaf edges	99.5%; 99.7%	Lesions on the leaf edges and leaf blades
	2.0% example 5	100%;100 %	Lesions on the leaf edges and leaf blades	99.9%;99.9 %	Scorching on the leaf edges and the leaf blades
	3.0% example 5	100%;94%	Many lesions on the leaf edges and leaf blades	100%;100%	Scorching on the leaf edges and the leaf blades
B	1.0% example 4	98%	No lesions	95%	No lesions

Plant compatibility

Maximal tolerable concentrations of formulation examples 2, 4 and 5 on plant organs

[numerical and sign data require no translation]

Examples	**Plant organ**	**Phalaenopsis[1]**		
		Damage	**Lesions**	
			BR	**BS**
1.0 % example 2	Flowers	0		
2.0% example 2		0		
3.0% example 2		0		
1.0% example 2	Leaves	0	0	0
2.0% example 2		0	0	0
3.0% example 2		+	+	0
1.0% example 4	Flowers	0		
2.0% example 4		0		
3.0% example 4		0		
1.0% example 4	Leaves	0	0	0
2.0% example 4		0	0	0
3.0% example 4		+	++	0
1.0% example 5	Flowers	++		
2.0% example 5		++		
3.0% example 5		+++	+++	+++

1.0% example 5	Leaves	+	++	++
2.0% example 5		++	+++	++
3.0% example 5		+++	+++	+++

Lesion. = Lesions

+++ = very many / very heavily damaged

++ = very / heavily damaged

+ = few / slightly damaged

0 = none / not damaged

BR = leaf edges

BS = leaf blades

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[1] orchid type

The test for a sufficient inactivation of phytopathogenic organisms gave in the following results:

1. Bactericidal action of examples 1 – 5 in a lab test according to "Guideline 16-4 for the Testing of Plant Protection Products for Disinfection in the Cultivation of Decorative Plants" of the Biological Federal Institute for Agriculture and Forestry (Braunschweig, 1986)

Required contact times of examples 1 – 5 for killing off the indicated bacterial strains

Examples	Xanthomonas pelargonii	Pseudomonas solanaceum	Erwinia amylovora
Tap water control	No activity	No activity	No activity
1.0% example 1	1 min.	1 min.	5 min.
1.0% example 2	1 min.	1 min	1 min
1.0% example 3	5 min	5 min	15 min
1.0% example 4	1 min	1 min	1 min
1.0% example 5	1 min	1 min	1 min

2. Fungicidal action of examples 1 – 5 in a lab test according to "Guideline 16-4 for the Testing of Plant Protection Products for Disinfection in the Cultivation of Decorative Plants" of the Biological Federal Institute for Agriculture and Forestry (Braunschweig, 1986)

Required contact times of examples 1 – 5 for killing off the indicated fungus test strains

Example	Fusarium oxysporum	Thielaviopsis basicola	Phythophtora sp	Cylindrocladium scoparium
Tap water control	No activity	No activity	No activity	No activity
1.0%example 1	16 h	> 16 h	1 h	> 16 h
2.0%example 1	4 h	4 h	1 h	> 16 h
1.0%example 2	4 h	4 h	1 h	> 16 h

2.0%example 2	1 h	1 h	5 min	16 h
1.0%example 3 2.0%example 3	4 h 4 h	16 h 4 h	1 h 30 min	16 h 4 h
1.0%example 4 2.0%example 4	1 h 1 h	4 h 1 h	30 min 15 min	16 h 4 h
1.0%example 5 2.0%example 5	1 h 1 h	4 h 1 h	1 h 5 min	16 h 16 h

Required contact times of examples 1 – 5 for inactivating the indicated viral strains (suspension test)

Disinfecting agent	TMV	PBY	PFBV	CNV	ORSV	PSTVd
Tap water control	No activity	No activity	No activity	No activity	No activity	No activity
1.0% example 1 2.0% example 1 3.0% example 1	16 h 16 h 16 h	16 h 4 h 4 h	4 h 1 h 1 h	16 h 4 h 4 h	4 h 1 h 1 h	4 h 1 h < 1 h
1.0% example 2 2.0% example 2 3.0% example 2	> 16 h 16 h 4 h	16 h 4 h 4 h	4 h 1 h 1 h	16 h 4 h 4 h	1 h < 1 h < 1 h	4 h 1 h 1 h
1.0% example 3 2.0% example 3 3.0% example 3	> 16 h 16 h 16 h	16 h 4 h 4 h	4 h 1 h 1 h	1 h < 1 h < 1 h	4 h 4 h 1 h	4 h 1 h 1 h
1.0% example 4	4 h	4 h	1 h	< 1 h	4 h	1 h

2.0% example 4	4 h	1 h	< 1 h	< 1 h	1 h	< 1 h
3.0% example 4	1 h	1 h	< 1 h	< 1 h	1 h	< 1 h
1.0% example 5	4 h	4 h	1 h	< 1 h	4 h	1 h
2.0% example 5	4 h	4 h	1 h	< 1 h	1 h	1h
3.0% example 5	1 h	1 h	< 1 h	< 1 h	1 h	< 1 h

TMV = Tobacco mosaic virus

PVY = Potato virus Y Potyvirus

PFBV = Pelargonium flower break carmovirus

CNV =Cucumber necrosis tombuvirus

ORSV = Odontoglossum ringspot virus

PSTVd = Potato spindle tuber viroid

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1.0% example 3	5 min	5 min	15 min
1.0% example 4	1 min	1 min	1 min
1.0% example 5	1 min	1 min	1 min